

- 31 -

Claims:

- 1 A biological reaction apparatus for receiving at least one substrate having a sample located in a sample region, and a separate cover, such that a reaction chamber is formed between the cover and substrate over the sample region, wherein the apparatus includes
- 5 a locating means to locate the substrate; .
- a cover locating means for locating and moving the cover with respect to the substrate;
- a fluid dispensing means for dispensing fluid into the reaction chamber; and
- 10 a draining mechanism;
- wherein the draining mechanism includes wicking means.
- 2 The biological reaction apparatus of claim 1 wherein the wicking means include points of contact on the substrate to provide a fluid path to drain fluid from the substrate.
- 15 3 The biological reaction apparatus of claim 1 or 2 wherein the substrates are supported in the apparatus from underneath.
- 4 A fill fluid for performing a filling of a reaction chamber, where the fill fluid has a viscosity higher than an antecedent fluid on a substrate.
- 5 The fill fluid of claim 4 wherein the fill fluid is miscible with water.
- 20 6 The fill fluid of claim 4 or 5 wherein the fill fluid has a higher boiling point than water.
- 7 The fill fluid of claims 4 to 6 wherein the fill fluid leaves no residue on the substrate or sample.
- 8 The fill fluid of claims 4 to 7 wherein the fill fluid is inert to biological reagents and samples.
- 25 9 The fill fluid of claims 4 to 8 wherein the fill fluid is a solution comprising glycerol.

- 32 -

- 10 The fill fluid of claim 9 wherein the fill fluid contains glycerol, water, and buffer.
- 11 The fill fluid of claims 9 or 10 wherein the fill fluid contains between 2% to 80% glycerol by volume.
- 12 The fill fluid of claim 9 to 11 wherein the fill fluid contains between 10%-60% glycerol per volume.
- 5 13 The fill fluid of claims 9 to 13 wherein the fill fluid contains between 20% to 30% glycerol.
- 14 The fill fluid of claims 4 to 13 wherein the fill fluid includes a surfactant to aid in the disbursement of any bubbles formed within the reaction chamber during a fill cycle.
- 10 15 The fill fluid of claim 14 wherein the surfactant is Tween.
- 16 A receptacle for substrates having receiving means adapted to locate a substrate and a cover.
- 17 The receptacle of claim 16 wherein the receiving means includes stations to locate and support the substrate, and the cover is supported on the substrate.
- 15 18 The receptacle of claims 16 or 17 wherein the receiving stations support the substrate around part of a periphery of the substrate.
- 19 The receptacle of claims 16 to 18 wherein the receiving means are defined by a respective aperture having peripheral ledges for supporting the substrates.
- 20 20 The receptacle of claim 19 wherein the apertures are adapted to receive support platforms from a reaction apparatus, such that when loaded in a reaction apparatus, the platforms support the substrates.
- 21 The receptacle of claims 16 to 20 wherein the receiving means have a lifting means for lifting the covers from the substrate.
- 25 22 The receptacle of claim 21 wherein the lifting means are ramps adapted to engage with projections on the cover.

- 33 -

- 23 The receptacle of claims 16 or 22 wherein the receiving means have guides allowing the cover to be moved with respect to the receptacle and slide.
- 24 A dispenser for a reaction apparatus including a fluid conduit,
a pump connected to the fluid conduit;
5 a locating means for moving the fluid conduit from a fluid source to a dispensing region.
- 25 The dispenser of claim 24 wherein the dispenser includes a bar code sensor to detect the type of fluid source and substrate.
- 26 The dispenser of claims 24 or 25 wherein the dispenser includes a means for
10 determining the volume of fluid remaining in a fluid source.
- 27 The dispenser of claim 24 wherein the sensor measures a change of capacitance of the fluid conduit to detect insertion into a fluid in the fluid container.
- 28 A method of dispensing fluid to a substrate including the steps of:
loading a reagent receptacle with at least one fluid container;
15 mounting the reagent receptacle to a reaction apparatus
detecting the reagent receptacle
once the reagent receptacle is detected, initiating a sensor to detect the type of fluid within the at least one fluid container
storing the information on fluid type to allow the fluid to be dispensed onto a
20 substrate when required.
- 29 The method of claim 28 wherein the sensor detects bar codes.
- 30 A reaction apparatus having a support projection for a slide, a dispensing means and a fluid removal means, where the a support projection is adapted to support a slide from underneath, and a wicking means contacting the periphery of the slide, such that the
25 wicking means provides a wicking path to remove fluid from the upper surface of the slide.

- 34 -

- 31 The reaction apparatus of claim 30 wherein the support projection is inclined between 0 and 10 degrees to the horizontal providing the mount with a fluid removal region.
- 32 The reaction apparatus of claim 30 or claim 31 wherein the wicking means is wicking posts.
- 5 33 The reaction apparatus of claim 32 wherein the wicking posts are located at the fluid removal region.
- 34 The reaction apparatus of claims 32 or 33 wherein the wicking means is adapted to extend across a significant proportion of the width of the slide.
- 35 A reaction apparatus adapted to locate a substrate having a surface containing a sample
10 and cover having a surface forming a reaction chamber with the sample containing surface, including a cover engaging means adapted to change the volume of the reaction chamber.
- 36 The reaction apparatus of claim 35 wherein the cover engaging means is a clamping mechanism adapted to clamp the cover to the substrate.
- 15 37 A reaction apparatus having a separate substrate tray:
the substrate tray adapted to hold number of substrates and covers;
at least one receiving station for receiving said substrate tray;
a dispensing means for dispensing fluid onto substrates in the substrate tray
wherein a reaction chamber is formed between the substrate and cover, such that
20 fluid dispensed onto the substrates enters the reaction chamber.
- 38 The reaction apparatus of claim 37 including a number of receiving stations, each station adapted to receive a substrate tray.
- 39 The reaction apparatus of claim 38 wherein the reaction apparatus has a controller,
which allows the fluid to be dispensed onto a substrate on one substrate tray
25 independently of any other substrate tray.

- 35 -

40 A reaction apparatus for receiving a substrate having a sample located in a sample region and a draining mechanism including wicking means for draining fluid from the substrate.

41 A method of forming a reaction chamber on a slide in a reaction apparatus including:

- 5 placing a cover having a cavity on a slide, forming a reaction chamber;
- locating the cover and slide in a receptacle of a tray;
- providing a receiving portion in the reaction apparatus having a mount for each receptacle in the tray;
- loading the tray into a receiving portion of the reaction apparatus, where the
- 10 receiving portion of the reaction apparatus locates the tray;
- releasably holding the cover to the slide; and
- releasing the tray from the slide and cover.

42 An apparatus for loading multiple slides and covers including a tray having a number of receptacles for slides and covers;

- 15 a receiving portion for receiving trays
- mounts for each receptacle located in the receiving portions
- a clamp for each mount
- wherein when a tray having slides and covers is loaded into the receiving portion,
- each clamp holds the cover on the slide to locate the slide, and the tray drops from
- 20 the slides so each slide is supported by the mount.

43 An apparatus as claimed in claim 42, wherein a draining means is provided.

44 An apparatus as claimed in claim 43, wherein the draining means includes a wicking means.

45 A method of undertaking reactions on samples on slides involving multiple steps

25 including:

- 36 -

- loading a first holder having at least one slide into a reaction apparatus;
- scanning the slide to determine the multiple steps in the reaction to take place on the slide;
- determining whether other holders have been loaded into the reaction apparatus;
- 5 undertaking the multiple steps required on the at least one slide associated with the first holder;
- when a second holder is detected, continue the steps in the reaction associated with the at least one slides in the first holder and then undertaking the at least one steps associated with the slides associated with the second holder.
- 10 46 A method as claimed in claim 45, wherein the first steps of the reaction of the at least one slides associated with the second holder are begun before the last steps of the reaction of the at least one slide associated with the first holder are completed.
- 47 An apparatus for performing reactions on slides including a tray having a plurality of receptacles adapted to support and locate slides and associated covers
- 15 receiving ports for the trays, the receiving ports having mounts associated with each receptacle of the tray;
- a clamping mechanism for clamping the cover and slide in place;
- a fluid draining means for draining fluid from the reaction chamber formed between the cover and slide;
- 20 fluid receptacles to allow at least one fluid to be placed on the apparatus;
- fluid dispensing means to dispense fluid onto the slides;
- wherein once the tray is loaded, the slides and cover are clamped and the tray is moved so that the slides and covers are supported on the mounts, fluid may be dispensed onto the slides by the dispensing means, and drained by the draining
- 25 means.
- 48 An apparatus as claimed in claim 47, wherein the apparatus includes a locating means for locating and moving the cover with respect to the slide.

- 37 -

- 49 An apparatus as claimed in claim 49, wherein there is a locating means associated with every receptacle in a tray.
- 50 An apparatus as claimed in claim 49, wherein all locating means associated with a particular tray all move at the same time to move the cover with respect to the slide, to
5 facilitate fluid dispensation or draining of all slides on a tray.
- 51 An apparatus for applying reagents to sample slides, including:
a plurality of ports for receiving the slides;
a reader for reading identification information on each of the slides; and
a reagent rack for receiving reagent containers which carry reagent to be deposited on
10 the slides; wherein
the slides are provided on trays, which are received in the associated ports such that each tray represents a separate batch of slides, to allow for addition and removal of separate trays, for batch processing during operation of the apparatus.
- 52 An apparatus for depositing reagent on sample slides including a reagent rack for
15 holding a plurality of reagent containers, a fluid conduit for transferring reagent from the containers onto the slides and a mixing station whereat reagents from different containers is combined and mixed using the fluid conduit.
- 53 A method of mixing reagents, for application to a sample slide, from a plurality of reagent containers including transferring reagents from the respective containers to a
20 mixing station using a fluid conduit and mixing the reagents at the mixing station by drawing the combined reagents back into the fluid conduit and redepositing same at the mixing station to cause agitated mixing of the reagents, prior to application to the sample.